

## BRIEFER ARTICLES.

### THE NUTATION OF HELIANTHUS.<sup>1</sup>

IN a former contribution<sup>2</sup> the writer presented the results of extended observations on the nutation of the wild variety of *Helianthus annuus*. Considerable subsequent study in the same direction has fully confirmed the statements made at that time. It was, however, impossible to present satisfactory illustrations of the plants in the field, no camera being at hand when the observations were made. Since there seems to be some skepticism as to the fact of nutation, it was thought desirable to add a few more recent studies and some photographs showing the actual appearance of the plants in the field.

During the summer of 1898 a series of observations was made in Columbus, O., on the common cultivated variety. The cultivated sunflower behaves very much like the wild one, except perhaps that it appears somewhat less striking in its reactions. The growing plants nutate from  $60^{\circ}$  to  $90^{\circ}$  west in the evening (figs. 1, 2), and from  $50^{\circ}$  to  $70^{\circ}$  or more, east in the morning (fig. 3). At night the leaves droop and the tips point downward.

When anthesis begins nutation ceases and the heads are tilted toward the east or northeast (fig. 4). Not only the main terminal heads but also some of those on the side branches take this position.

<sup>1</sup> Contributions from the Botanical Laboratory, Ohio State University. VII.

<sup>2</sup> Observations on the nutation of *Helianthus annuus*. BOT. GAZ. 25: 395-403.



FIG. 1.—Cultivated *Helianthus annuus* at 6 P.M., three plants showing the westward nutation, and two with the heads tipped to the east.



The effect is most striking, however, in the case of plants with a single large head. It was observed that plants growing on the south

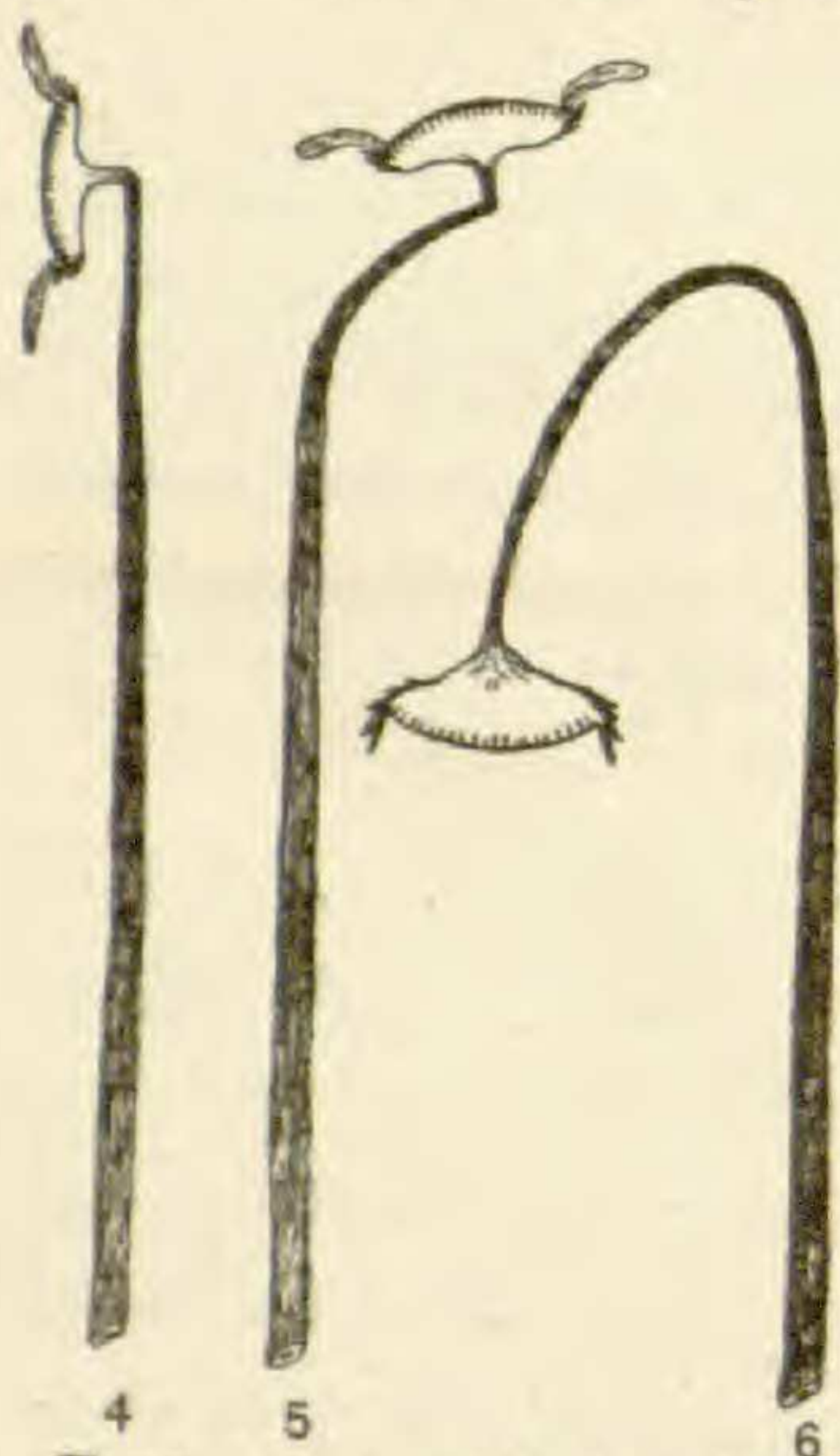


FIG. 2.—Cultivated *H. annuus* just before sunset, showing westward nutation.



FIG. 3.—The same plant as in *fig. 2*, at 7 A.M. the next morning, showing eastward notation.

side of a house did not tip to the east but to the south. This may have been caused by the reflection of the sunlight from the wall. The



FIGS. 4, 5, and 6.—Diagrams showing tipping of heads at anthesis (4, 5), and position when fruiting (6).

eastward position is often disturbed by the wind, so that the heads may appear to face in any direction. Sometimes the heads tip to the east while the stem below still continues to nutate (*figs. 4, 5*). This condition gave a very unique appearance to the plant when nutating in the evening. The same phenomenon has since been observed also in wild *Helianthus annuus*. After the seeds begin to develop the weight of the head bends the stem over, and the sharp angle caused by the tipping disappears (*fig. 6*). *Fig. 1*, taken at six o'clock in the afternoon, shows well the mode of nutation and also the eastward tipping of some of the flowering heads. The tipping of the head is of advantage in bringing the bracts of the involucre



into the best position for photosynthesis, and appears to be a definite physiological adaptation. The downward turning of the head which occurs later may be produced by the weight of the developing seeds, but it must not be forgotten that this is also a decided advantage. The whole large disk filled with seed is thus well protected from the rain, the dying bracts, no longer useful for food manufacture, forming a roof which sheds water very successfully. This position also permits



FIG. 7.—Wild *H. annuus*, 7 A.M. July 17, 1899, showing eastward nutation.

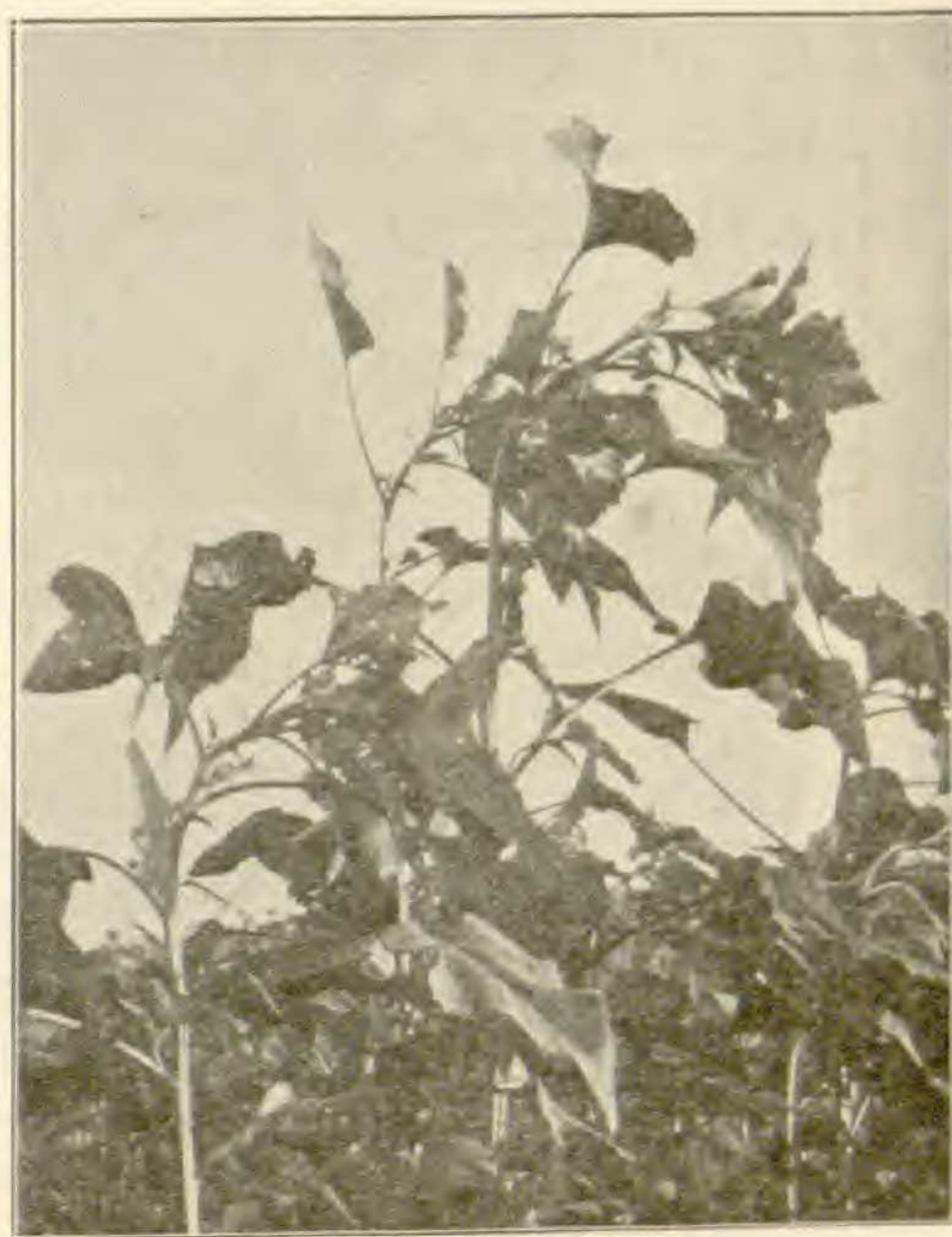


FIG. 8.—The same group of plants as in *fig. 7*, at 7 P.M. of the same day, showing the more prominent westward nutation.

the seed to fall readily to the ground and at the same time affords considerable protection from birds, many of which are very fond of the seed.

During the summer of 1899 some observations were again made upon the wild variety of *H. annuus*, in Clay county, Kansas. There is nothing new to add to the report in my former paper, but a number of photographs are presented showing the character of the nutation. *Fig. 7* shows a group of plants at seven o'clock in the morning of July 17, and *fig. 8* represents the same group at seven o'clock of the evening of the same day. The more pronounced nutation in the evening is very apparent. *Fig. 9* shows a field of young sunflowers just at sunset on June 27. The plants in the foreground show the striking



effect of a large field of plants all bending to the west. The tipping of the heads to the east or northeast is at times very prominent. *Fig. 10* shows a small patch of plants with the heads in this position.



FIG. 9.—A field of wild *H. annuus*, just at sunset, June 27, showing the pronounced westward nutation in young plants.

The writer knows of no better plant for the study of the light relation of leaves than *Helianthus annuus*, and it can be made an object of great interest to the young student.

Some observations were also made upon *H. petiolaris*. It was observed to nutate  $90^{\circ}$  west in the evening, before the heads came into



FIG. 10.—A patch of wild *H. annuus* at noon, August 23; the heads tip toward the northeast.

bloom, the nutation being nearly as marked as in *H. annuus*. On opening, the heads generally tip and the direction is usually to the northeast, at least for the terminal ones. But this movement is much less prominent than in *H. annuus*.—JOHN H. SCHAFFNER, *Columbus, Ohio*.